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## XVII. Science and Technology/Engineering, Grade 8

## Grade 8 Science and Technology/Engineering Test

The spring 2010 grade 8 MCAS Science and Technology/Engineering test was based on learning standards in the Massachusetts *Science and Technology/Engineering Curriculum Framework* (2006). The *Framework* identifies four major content strands listed below. Page numbers for the grades 6–8 learning standards appear in parentheses.

- Earth and Space Science (*Framework*, pages 32–33)
- Life Science (Biology) (*Framework*, pages 51–53)
- Physical Sciences (Chemistry and Physics) (*Framework*, pages 67–68)
- Technology/Engineering (*Framework*, pages 87–89)

The *Science and Technology/Engineering Curriculum Framework* is available on the Department website at [www.doe.mass.edu/frameworks/current.html](http://www.doe.mass.edu/frameworks/current.html).

In test item analysis reports and on the Subject Area Subscore pages of the MCAS *School Reports* and *District Reports*, Science and Technology/Engineering test results are reported under four MCAS reporting categories, which are identical to the four framework content strands listed above.

### Test Sessions

The MCAS grade 8 Science and Technology/Engineering test included two separate test sessions. Each session included multiple-choice and open-response questions. Approximately half of the common test items are shown on the following pages as they appeared in test booklets.

### Reference Materials and Tools

The use of bilingual word-to-word dictionaries was allowed for current and former limited English proficient students only, during both Science and Technology/Engineering test sessions. No other reference tools or materials were allowed.

### Cross-Reference Information

The tables at the conclusion of this chapter indicate each released and unreleased common item's reporting category and the framework learning standard it assesses. The correct answers for released multiple-choice questions are also displayed in the released item table.

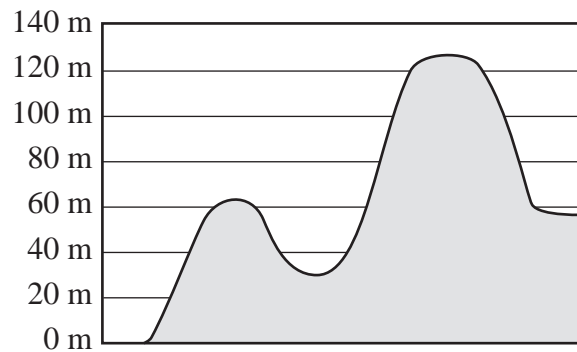
# Science and Technology/Engineering

## SESSION 1

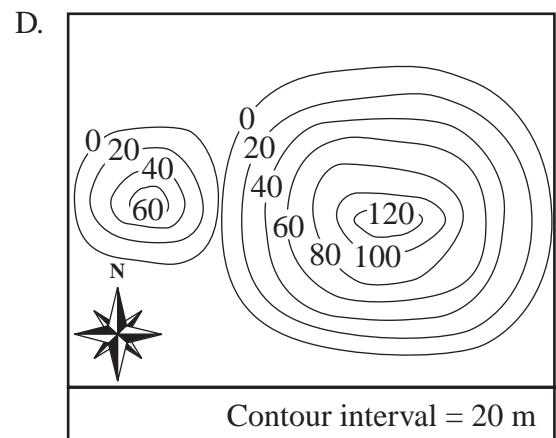
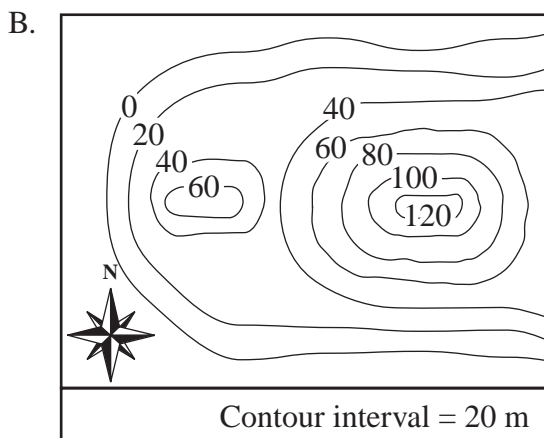
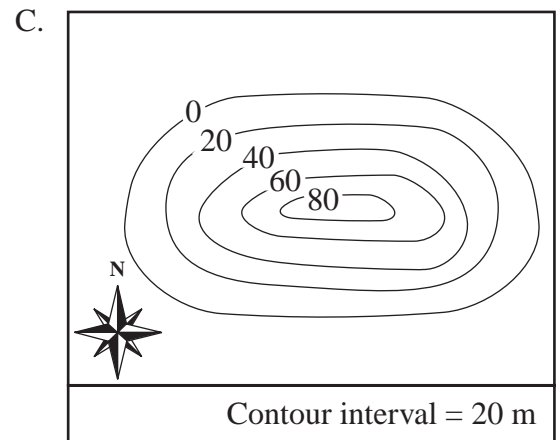
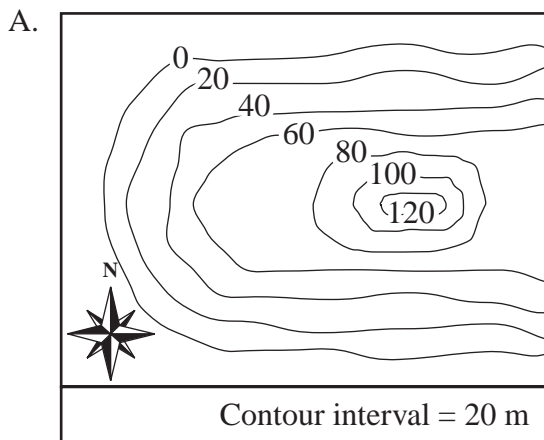
### DIRECTIONS

This session contains seven multiple-choice questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

- 1 The diagram below shows a side view of a landform with different elevations.



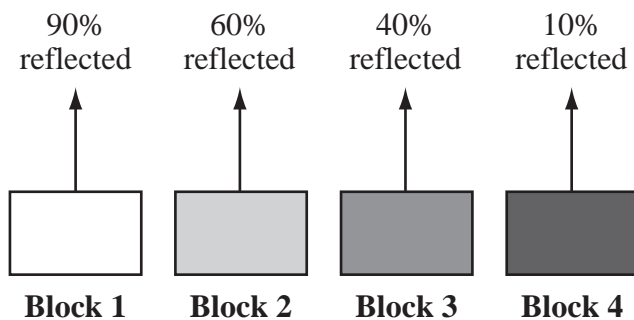
Which of the following maps **best** represents this landform?



- 2 Substances enter any plant or animal cell by passing through which of the following structures?

A. nucleus  
B. cell membrane  
C. vacuole  
D. chloroplast

- 3 Four different-colored blocks are placed outside in bright sunlight. The blocks are identical except for color. The diagram below shows the amount of light reflected from each block.



Which block will increase in temperature **most** rapidly?

A. block 1  
B. block 2  
C. block 3  
D. block 4

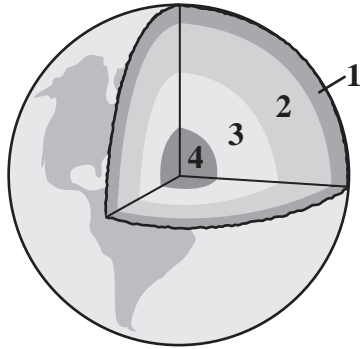
- 4 In the design process, a trade-off occurs when a problem is solved but a feature is sacrificed. Which of the following is an example of a trade-off?

A. A car's gas mileage is increased and the engine has less power.  
B. An airplane uses a more efficient engine and has higher performance.  
C. A sports drink's taste is improved and has the same nutritional content.  
D. A computer company upgrades the hardware and the price remains unchanged.

- 5 The Appalachian Mountains, which extend from Canada to Alabama, were much taller in the past than they are today. Which of the following two processes are **most** responsible for the decrease in the height of the Appalachian Mountains?

A. weathering and erosion  
B. sedimentation and flooding  
C. volcanic eruptions and landslides  
D. tectonic collisions and earthquakes

- 6 The diagram below shows four layers of Earth. Each layer is identified by a number.



Which layer of Earth is composed **primarily** of solid iron?

- A. layer 1
- B. layer 2
- C. layer 3
- D. layer 4

- 7 What is the smallest unit of a chemical compound that still has the properties of that compound?

- A. a nucleus
- B. a molecule
- C. an element
- D. an atom

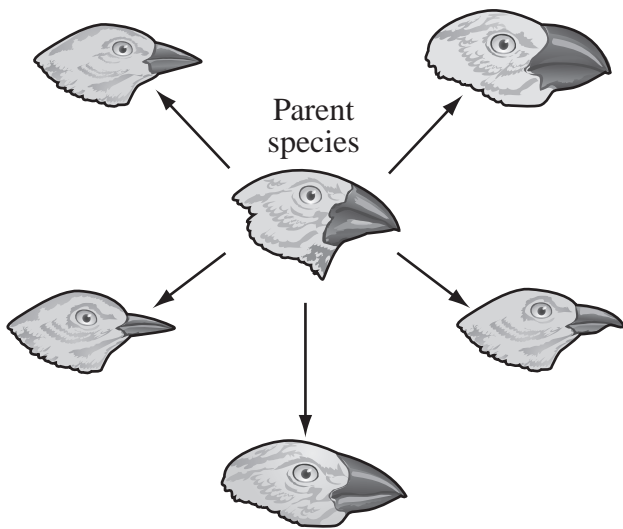
# Science and Technology/Engineering

## SESSION 2

### DIRECTIONS

This session contains twelve multiple-choice questions and two open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

- 8 The diagram below shows the beaks of five species of birds that developed over time from one parent species. The five species of birds can be found living in the same area.



Which of the following **best** explains why the beak shape of each species of bird developed differently?

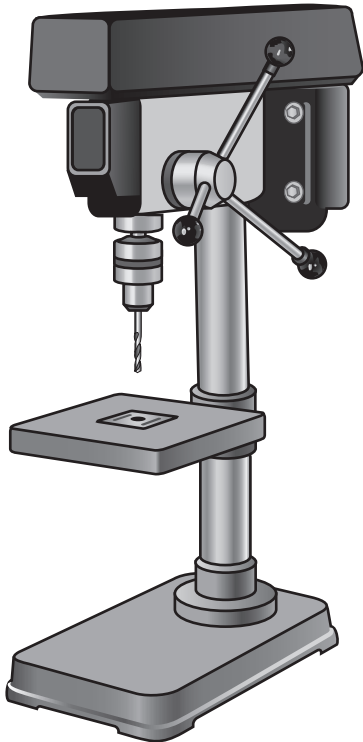
- A. Each beak shape helps the birds to produce different songs.
- B. Each beak shape is an adaptation to a specific source of food.
- C. Each beak shape is designed to construct a different type of nest.
- D. Each beak shape helps protect the birds from a different predator.

- 9 Some species of bacteria produce a substance that is toxic to insects but harmless to humans. Scientists have isolated the gene that controls production of this substance.

Which of the following is the **best** reason for inserting this gene into corn plants?

- A. The corn will grow faster.
- B. Less fertilizer will be needed.
- C. Fewer pesticides will be needed.
- D. The corn will be more nutritious.

- 10 The picture below shows a machine used in a factory to make metal parts for toy cars.



What is the **most likely** purpose of this machine in making the metal parts?

- A. to sand the parts
- B. to make holes in the parts
- C. to fasten the parts together
- D. to measure the size of the parts

- 11 Which of the following statements **best** describes a result of using interchangeable parts to manufacture automobiles?
- A. The automobiles are identical.
  - B. The automobiles wear out quickly.
  - C. The automobiles are difficult to design.
  - D. The automobiles can be produced on an assembly line.
- 12 Which of the following correctly lists the structures in space from smallest to largest?
- A. star, galaxy, solar system, universe
  - B. star, solar system, galaxy, universe
  - C. star, solar system, universe, galaxy
  - D. star, universe, solar system, galaxy

- 13 One of the most common types of adaptations in plants involves the shape and structure of each plant's leaves. The surface area of leaves is related to the amount of water a plant loses.

Based on this information, which of the following plants is probably **best** adapted for living in a hot, dry climate?

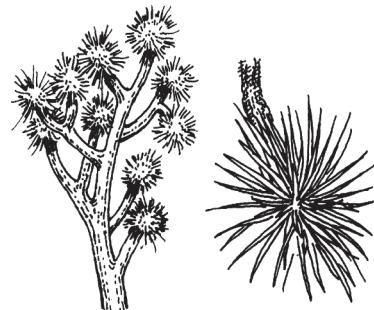
A.



B.



C.



D.





- 14 Which of the following planets is **always** closer to the Sun than it is to Earth?

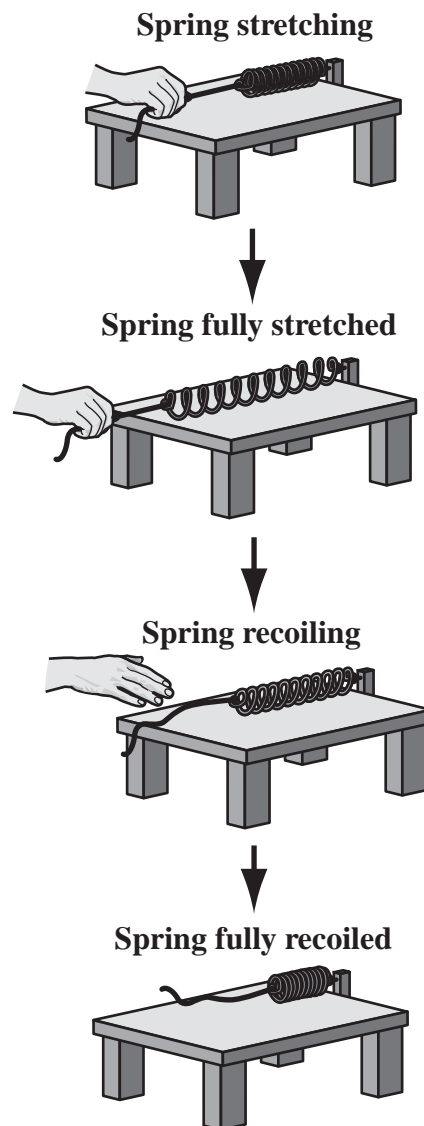
A. Jupiter  
B. Mercury  
C. Saturn  
D. Uranus

- 15 Company X makes 100 custom buses each year. Company Y makes 10,000 of one type of bus each year.

Which of the following is the **most likely** reason a customer would buy a bus from company X instead of company Y?

A. to keep the cost of the bus low  
B. to ensure that the bus will be easy to replace  
C. to provide ideas about how the bus will be built  
D. to ensure that people know how to drive the bus

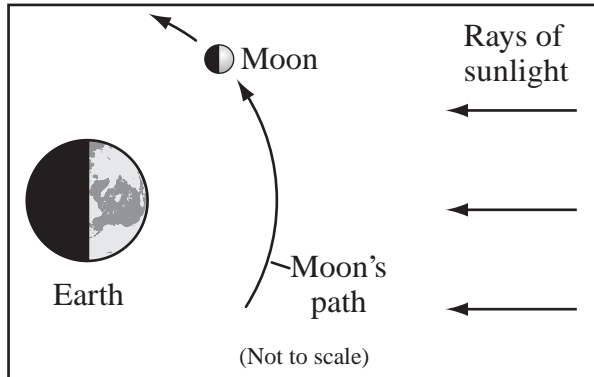
- 16 A student is investigating potential and kinetic energy by stretching a spring across a table. When the student lets go, the spring recoils.




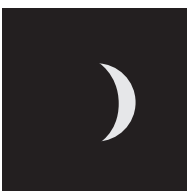
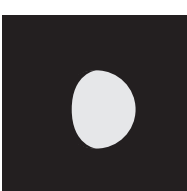

At which time is potential energy in the spring being converted into kinetic energy in this system?

A. when the spring is stretching  
B. when the spring is fully stretched  
C. when the spring is recoiling  
D. when the spring is fully recoiled

- 17 The diagram below shows the relative positions of Earth and the Moon and rays of sunlight.



Based on the diagram, which of the following **best** represents how the Moon would appear as seen from Earth?

- A. 
- B. 
- C. 
- D. 

- 18 A stone arch bridge relies **primarily** on which of the following for its load strength?

- A. bending  
B. compression  
C. tension  
D. torsion

- 19 A company is making prototypes for a new computer system. Which of the following statements **best** describes an advantage of making several different prototypes?

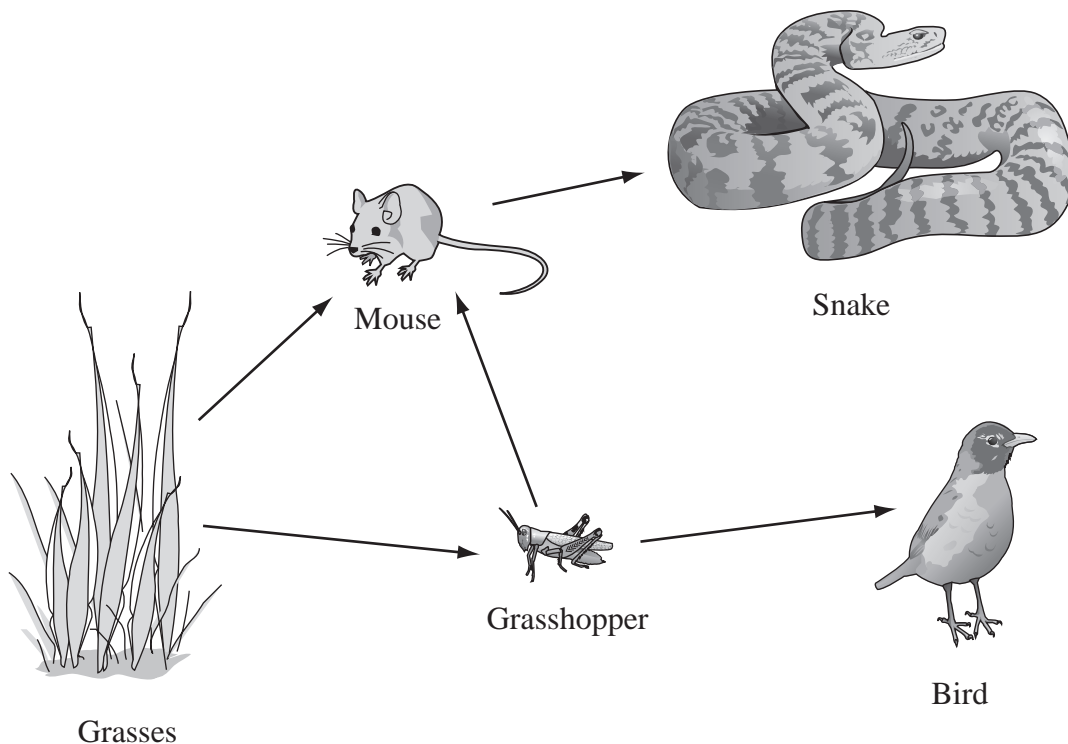
- A. They can be tested at the same time.  
B. They can be produced in large numbers.  
C. They will be bought by many different users.  
D. They will be sold for more than they cost to build.

Questions 20 and 21 are open-response questions.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 20 in the space provided in your Student Answer Booklet.

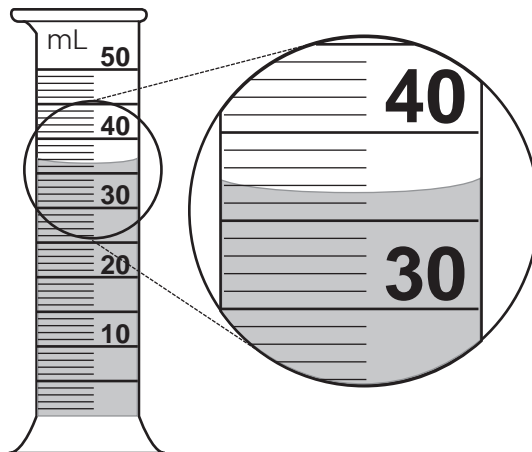
- 20 The partial food web below shows five different organisms that are found in a prairie ecosystem.



- Identify **each** organism in this food web as a producer, a primary consumer, or a secondary consumer.
- Using only the organisms from this food web, describe **one** change in this prairie ecosystem that would result in a decrease in the grasshopper population. Explain the reasoning for your answer.

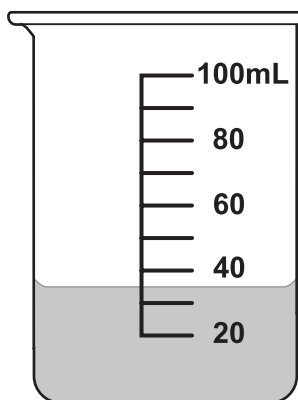
Write your answer to question 21 in the space provided in your Student Answer Booklet.

- 21 The picture below shows a sample of liquid in a graduated cylinder.



- Identify what property of the sample is being measured with the graduated cylinder.
- Identify the measurement of the sample in the graduated cylinder. Include units and use the correct number of significant digits in your answer.

The entire sample was transferred to a 100 mL beaker, as shown below.



- Identify the measurement of the sample in the beaker. Include units and use the correct number of significant digits in your answer.
- Explain why the measurements would be recorded differently when the sample is in the graduated cylinder and when it is in the beaker.

**Grade 8 Science and Technology/Engineering**  
**Spring 2010 Released Items:**  
**Reporting Categories, Standards, and Correct Answers\***

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)*
1	273	<i>Earth and Space Science</i>	1	B
2	274	<i>Life Science (Biology)</i>	3	B
3	274	<i>Physical Sciences (Chemistry and Physics)</i>	14	D
4	274	<i>Technology/Engineering</i>	2.5	A
5	274	<i>Earth and Space Science</i>	6	A
6	275	<i>Earth and Space Science</i>	2	D
7	275	<i>Physical Sciences (Chemistry and Physics)</i>	6	B
8	276	<i>Life Science (Biology)</i>	18	B
9	276	<i>Technology/Engineering</i>	7.2	C
10	277	<i>Technology/Engineering</i>	1.3	B
11	277	<i>Technology/Engineering</i>	4.2	D
12	277	<i>Earth and Space Science</i>	12	B
13	278	<i>Life Science (Biology)</i>	10	C
14	279	<i>Earth and Space Science</i>	10	B
15	279	<i>Technology/Engineering</i>	4.1	C
16	279	<i>Physical Sciences (Chemistry and Physics)</i>	13	C
17	280	<i>Earth and Space Science</i>	9	B
18	280	<i>Technology/Engineering</i>	5.3	B
19	280	<i>Technology/Engineering</i>	2.3	A
20	281	<i>Life Science (Biology)</i>	14	
21	282	<i>Physical Sciences (Chemistry and Physics)</i>	3	

\* Answers are provided here for multiple-choice items only. Sample responses and scoring guidelines for open-response items, which are indicated by shaded cells, will be posted to the Department's website later this year.

**Grade 8 Science and Technology/Engineering  
Spring 2010 Unreleased Common Items:  
Reporting Categories and Standards**

<b>Item No.</b>	<b>Reporting Category</b>	<b>Standard</b>
22	<i>Life Science (Biology)</i>	5
23	<i>Life Science (Biology)</i>	17
24	<i>Technology/Engineering</i>	3.4
25	<i>Technology/Engineering</i>	6.2
26	<i>Life Science (Biology)</i>	9
27	<i>Physical Sciences (Chemistry and Physics)</i>	1
28	<i>Technology/Engineering</i>	6.3
29	<i>Physical Sciences (Chemistry and Physics)</i>	9
30	<i>Life Science (Biology)</i>	8
31	<i>Earth and Space Science</i>	5
32	<i>Earth and Space Science</i>	11
33	<i>Technology/Engineering</i>	3.1
34	<i>Physical Sciences (Chemistry and Physics)</i>	5
35	<i>Physical Sciences (Chemistry and Physics)</i>	8
36	<i>Physical Sciences (Chemistry and Physics)</i>	11
37	<i>Life Science (Biology)</i>	13
38	<i>Life Science (Biology)</i>	1
39	<i>Earth and Space Science</i>	8
40	<i>Life Science (Biology)</i>	12
41	<i>Earth and Space Science</i>	3
42	<i>Physical Sciences (Chemistry and Physics)</i>	7